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(19)

(54) EDIBLE FAT COMPOSITIONS

(71) We, UNILEVER LIMITED, a company organised under the laws of Great Britain, of Unilever House, Blackfriars, London, E.C.4, England, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to edible fat compositions suitable for use in confectionery, especially hard butters for use in couverture formulations intended for marketing in tropical climates.

Cocoabutter is in general too expensive to be used in the manufacture of chocolate intended for couvertures and other fats, referred to as hard butters, are used in the confectionery industry. The melting requirements for these hard butters are less critical than those which must be met in the manufacture of block chocolate and high grade confectionery. Nevertheless, couverture chocolate compositions require a fat component having a slip melting point of not more than about 42°C, so that the product will not be waxy or chewy in the mouth. At the same time, the composition should be substantially solid at temperatures at which it is normally handled and if possible exhibit a solids content of at least 40% at 20°C, corresponding to a dilation at that temperature of at least 1,000. In tropical climates this latter requirement may be appreciably greater. The dilations discussed in this specification are measured in accordance with the method described in British Patent Specification No. 859,769.

The present invention provides an edible fat composition suitable for use in confectionery, having a randomly distributed fatty acid composition of a blend of a lauric fat with a smaller weight of a stearine fraction of a non-lauric C_{16}—C_{18} edible fat, the composition having a maximum slip melting point of 45°C, a maximum Iodine Value of 20 and a minimum dilatation at 20°C of 900. More particularly the maximum Iodine Value is preferably 12 and the minimum dilatation at 20°C 1200. In this specification all percentages, ratios and parts are by weight.

Preferably the stearine is a vegetable fat stearine, more preferably a palm fat stearine, i.e. a fraction of palm oil or cottonseed oil. Stearines of other vegetable fats which are wholly liquid above 15°C may be obtained by first hardening the oil by decrease of about 20 Iodine Value units and fractionating a stearine from the hardened oil. Stearines may also be made by low temperature directed interesterification of liquid oils from which they may be separated by conventional crystallisation fractionation methods.

The stearine fractions should preferably have an Iodine Value of from 5 to 40 and slip melting points from 40 to 60°C, preferably 45 to 60°C. They may be obtained by dry fractionation, solvent fractionation or by the so-called Lanza method utilising aqueous surfactant dispersions to separate fat crystals from liquid fats in the fractionation process. For stearines of Iodine Value 15 a lauric fat to stearine ratio of 2:1 is preferred.

Suitable oils from which the stearine fractions may be obtained include sunflower, safflower, groundnut and soyabean oils. these oils may also be present in the compositions of the invention in whole, hydrogenated form.

The lauric fat component may be provided by any of the naturally occurring lauric fats, alone or in blends with one another, for example coc nut oil, palm kernel oil, babassu or tucum oil, the first being preferred. The lauric component may also be provided by crystallisation fractions of these oils or their

hydrogenation products. Coconut-paring oil is particularly preferred, being the oil extracted from the inner part of the pericarp. It contains a high proportion of coconut oil but has a higher Iodine Value, about 25, compared with about 9 for coconut oil itself. It is in plentiful supply in the Philippines and Ceylon, parts of India and Japan.

The compositions of the invention are preferably constituted by at least 15% of the stearine component, preferably 15 to 45%, particularly 25 to 40%. Compositions comprising at least 30% stearine and having Iodine Values of at least 4 are also preferred, and those comprising at most 20% stearine and having a slip melting point of 45 to 60°C. Smaller quantities exercise insufficient influence on the properties of the product, while on the other hand amounts of 50% or more result in an unduly high melting product having a chewy taste. Between these limits the proportions may be varied in accordance with the characteristics of the two components and the ambient conditions in which they are marketed and/or used. Other things being equal, a high proportion of palm fat stearine, e.g. 30 to 45%, confers a harder characteristic on the product which is valued in tropical countries. As a rough guide, an increase of 10% in the level of stearine is compensated for by a 5-unit increase in Iodine Value, the slip melting point remaining more or less unchanged.

The Iodine Value requirement ensures adequate hardness in the product. The particular value adopted in each case is related to the intended use of the product. For hard butters for couvertures preferably the maximum Iodine Value is 12. This assures a sufficiently high dilatation at 20°C of at least 1200, but for this purpose higher amounts of lauric fats may require lower Iodine Values, down to zero. For toffee fats a minimum dilatation at 20°C of 900 is sufficient and a range from 10 to 18 is preferred for the Iodine Value.

The products of the invention are prepared by a process comprising fractionating a non-lauric edible C_{16}—C_{18} fat to obtain a stearine fraction and randomising a blend of a lauric fat with a smaller weight of the stearine fraction, if necessary with hydrogenation before or after blending to obtain a composition having a maximum slip melting point of 45°C, a minimum dilatation at 20°C of 900 and a maximum Iodine Value of 20.

Hydrogenation to achieve the required Iodine Value may be applied to either of the components separately, or to the blend before or after randomisation. A final hydrogenation step may assist with decolourising the product. Hydrogenation is preferably non-selective, using fresh nickel catalyst. Strictly speaking a final hydrogenation step may marginally disturb the complete randomisation, but the change in composition is very slight and has little effect on physical properties. Preferably the process of the invention comprises fractionating a palm fat to obtain a stearine having an Iodine Value from 5 to 40, blending the lauric fat with a smaller weight of the stearine, randomising the blend and hydrogenating the randomised blend non-selectively. Alternatively a C_{16}—C_{18} edible vegetable fat which is wholly liquid at 15°C may be hydrogenated to provide a decrease of 20 Iodine Value units, followed by fractionating the hardened fat obtained to produce a stearine fraction having an Iodine Value from 5 to 40 and a slip melting point from 40 to 60°C and coconut oil blended with a smaller weight of the stearine and the blend randomly interesterified and hydrogenated non-selectively.

Interesterification is usually carried out in the presence of a small amount of an alkali metal catalyst, e.g. the metals themselves or lower alkali metal alkoxides containing up to 4 carbon atoms, when preferably a temperature within the range 50 to 150°C is adopted and temperatures of 200°C and above are not for preference used, as the triglycerides start to decompose or isomerise at these temperatures. The reaction is usually completed within a very short time, but it is preferred to maintain the blend under reaction conditions for from ¼ hour to 4 hours. The catalyst is then destroyed and removed by aqueous washes from which the fat may be separated and dried.

The hard butters of the present invention may be formulated in couverture or other confectionery compositions in the customary manner. Usually the fat is blended with a similar quantity of icing sugar, together with a little chocolate colouring and flavouring, preferably provided by up to 20% cocoa powder of reduced fat content.

EXAMPLE 1.

A palm stearine having a slip melting point of 48°C and an Iodine Value of 42 was obtained by dry fractionating crude palm oil of Iodine Value 52. The oleine

was discarded and the stearine residue neutralised and dried to a free fatty acid level less than 0.1% and a maximum moisture content 0.02%.

A blend was prepared with 35% of the palm stearine and 65% of refined coconut oil of Iodine Value 8 and similarly low moisture and free fatty acid content.

The blend was interesterified at 110°C, using 0.3% sodium methoxide as catalyst, which was removed after ½ hour, when the reaction was complete.

The blend was washed and dried and found to have a slip melting point of 31°C. It was hydrogenated with 1% fresh supported nickel catalyst at 180°C and 20 to 30 psig, in stages to provide a series of products of varying Iodine Values and melting characteristics as shown in Table I, which includes the corresponding characteristics for the unhydrogenated sample. The combined fatty acid analysis of the final product was as follows:—

Saturated	C_6	0.4
	C_8	6.9
	C_{10}	4.8
	C_{12}	29.5
	C_{14}	11.3
	C_{16}	24.9
	C_{18}	18.4
		96.2
C_{18} unsaturated	Mono	3.8
	Di	trace

TABLE I

Product	I.V.	Slip M.Pt.°C	Dilatations @ °C D_{20}	D_{25}	D_{30}	D_{35}	D_{40}
1	9.2	34.7	1275	980	555	140	20
2	7.4	36.1	1355	1100	630	200	25
3	6.1	36.6	1405	1155	695	250	25
4	5.9	37.1	1440	1170	770	285	25
5	4.4	37.9	1465	1230	785	370	35
6	3.3	38.2	1505	1255	870	355	60

Of the entries in Table I, all were suitable, but those with Iodine Values 4 to 8 were preferred, those below this range providing a less satisfactory oral response, evident from the high slip melting point. By contrast with this example, corresponding samples, both hydrogenated and unhydrogenated, were prepared, with Iodine Values above 12. These were unsatisfactory, with dilatations below 1000 at 20°C.

Satisfactory couvertures were prepared according to the formulation in Table II.

TABLE II

	Milk Formulation	Dark Formulation
Cocoa Powder (10—12% fat content)	5.0	21.0
Sugar	43.0	45.0
Skimmed Milk Powder	16.5	—
Fat	35.5	34.0
	100.0	100.0
Lecithin	0.45	0.45
Vanillin	0.07	0.07
Salt	0.05	—

EXAMPLE 2.

A palm stearine of slip melting point of 44°C and Iodine Value ca. 30 obtained by Lanza fractionation, was blended in the proportions 35:65 with coconut oil, interesterified and hydrogenated as described in Example 1, to provide a product of Iodine Value 6.3 and slip melting point 37.0°C. Its dilatation values were: D_{20} 1380, D_{25} 1060, D_{30} 610, D_{35} 200 and D_{40} 20. The product was incorporated into couvertures as described in Example 1 and found to be satisfactory.

EXAMPLE 3.

10 parts of a stearine fraction of Iodine Value 8, slip melting point 58°C, obtained by fractionation (twice) of palm oil from acetone at 18 to 20°C, were blended with 90 parts of an oleine of Iodine Value 22, obtained by Lanza fractionation of palm kernel oil and the blend interesterified and hydrogenated as described in Example 1, except that the hydrogenation was substantially complete, the Iodine Value of the product being only 0.4. Its slip melting point was 38.0°C.

The product was again satisfactory, its dilatation values being: D_{20} 1590, D_{30} 875, D_{35} 320 and D_{40} 35.

Satisfactory products could also be obtained by hydrogenation as described, to Iodine Values 3, 5 or 8, or interesterified blends of 35 parts of the solvent-fractionated palm stearine, either with 65 parts whole coconut oil, or with 30 parts coconut oil and 35 parts of the palm kernel oleine.

EXAMPLE 4.

Palm oil was fractionated twice from acetone, at 0°C and 19°C, and a stearine fraction recovered of Iodine Value 10 and slip melting point 58°C.

10 parts of the stearine were blended with 65 parts coconut oil and 25 parts palm oil. The blend had an Iodine Value of 19.2 and was interesterified and hydrogenated as previously described, to give a product of Iodine Value 6.1 and slip melting point 36.9°C. The dilatation values of the product were: D_{20} 1500, D_{25} 1220, D_{30} 805, D_{35} 325 and D_{40} 25.

A further product was prepared by blending 30 parts of the same palm stearine with 10 parts coconut oil and 60 parts fully hydrogenated coconut oil. The blend had an Iodine Value 4.5 and after interesterification but without further hydrogenation had a slip melting point 36.1°C and the following dilatation values: D_{20} 1435, D_{25} 1185, D_{30} 765, D_{35} 220 and D_{40} 20.

Both products were found to be satisfactory in the couverture formulations of Table II.

EXAMPLE 5.

A blend of 35/65 dry fractionated palm oil of slip melting point 48°C and

Lanza-fractionated palm kernel oil, slip melting point 22°C, was randomly interesterified at 115°C, using 0.4% sodium methoxide catalyst, giving a product of slip melting point 30°C. The catalyst was removed and the interesterified blend was then hydrogenated as described in Example 1, to an Iodine Value of 15. The characteristics of the product were as follows:—

I.V.	Slip M.Pt.	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}
14.7	35.2°C	1260	1010	555	14	10

The product was deodorised by steam injection for 5 hours at about 180°C an 1 mm Hg pressure and tested in biscuit cream. This was prepared by blending the fat with an equal amount of coconut oil and mixing 40% of the softened blend with 60% icing sugar with stirring. The adhesion of the biscuit cream on biscuits was found satisfactory and it exhibited a quick, non-greasy melt-down in the mouth.

The deodorised product was also mixed and heated in a stirred vertical toffee boiler at about 120°C for 18 minutes, with twice its weight of each of granulated sugar, corn syrup and condensed milk, with a little water and salt and vanilla added for flavour. After setting, the toffee obtained was found to have a satisfactory mouth-feel with good set-up.

EXAMPLE 6.

Cottonseed oil was solvent-winterised to give a cottonseed stearine of IV 73.2 and it had the following fatty acid composition:—

Myristic acid	0.4%
Palmitic acid	49.8%
Stearic acid	1.5%
Oleic acid	11.7%
Linoleic acid	36.5%

Palm kernal oil was Lanza-fractionated to give a palm kernel oleine of IV 20.9 with the following fatty acid composition:—

Caproic	0.2%
Caprylic	4.6%
Capric	4.1%
Lauric	45%
Myristic	12.5%
Palmitic	8.6%
Stearic	2.9%
Oleic	19.7%
Linoleic	2.3%

25% of the cottonseed stearine was interesterified with 75% of palm kernel oleine to give an oil of IV 34. This oil was hydrogenated to give samples in the range of IV between 17 and 3. These samples had the following properties:—

IV	D_{20}	D_{25}	D_{30}	Slip M.Pt.°C
17	960	645	275	32.4
13	1135	805	415	33.9
8	1340	1015	620	36.2
3	1520	1230	865	38.8

EXAMPLE 7.

Palm oil was dry-fractionated to produce a liquid oil for frying purposes and a stearine residue of IV 43.

80% of coconut-paring oil was interesterified with 20% of the stearine obtained by dry fractionation of palm oil. The interesterified mixture had an IV of 24.5 and the following fatty acid composition:—

Caproic	0.4%
Caprylic	4.4%
Capric	3.8%
Lauric	28.6%
Myristic	11.1%
Palmitic	23.4%
Stearic	3.8%
Oleic	20.0%
Linoleic	4.2%
Arachidic	0.1%

The interesterified mixture was neutralised and hydrogenated to give samples with the following properties:—

IV	D_{20}	D_{25}	D_{30}	D_{35}	Slip M.Pt.°C
(Feedstock 24.5	675	360	125	30	30.6)
15	1180	835	455	105	34.0
12	1315	980	585	170	35.3
7.5	1510	1215	805	305	37.5
5	1610	1345	940	380	38.8
3	1680	1450	1055	480	39.9

All the hydrogenated samples from Examples 6 and 7 gave satisfactory performance in couvertures.

WHAT WE CLAIM IS:—

1. An edible fat composition suitable for use in confectionery, having a randomly distributed fatty acid composition of a blend of a lauric fat with a smaller weight of a stearine fraction of a non-lauric edible C_{16}—C_{18} fat, the composition having a maximum slip melting point of 45°C, a minimum dilatation at 20°C of 900 and a maximum Iodine Value of 20.

2. A composition according to Claim 1 having a minimum dilatation at 20°C of 1200 and a maximum Iodine Value of 12.

3. A composition according to Claim 1 or 2 which comprises 15 to 45 wt.% of the stearine.

4. A composition according to Claim 3 which comprises 25 to 40 wt.% of the stearine.

5. A composition according to any of the preceding claims comprising at least 30 wt.% stearine and having an Iodine Value of at least 4.

6. A composition according to Claim 1 comprising at most 20 wt.% stearine having a slip melting point of 45 to 60°C.

7. A composition according to any of the preceding claims in which the Iodine Value of the stearine is 15 and the weight ratio of the lauric fat to stearine is 2:1.

8. A composition according to any of the preceding claims in which the stearine comprises a hardened fat stearine.

9. A composition according to any of the preceding Claims 1 to 7 in which the stearine comprises palm stearine.

10. A composition according to any of the preceding Claims 1 to 7 in which the stearine comprises a stearine of sunflower or safflowerseed oil, groundnut or soyabean oil.

11. A composition according to any of the preceding claims in which the lauric fat comprises coconut oil.

12. A composition according to any of the preceding Claims 1 to 10 in which the lauric fat comprises cocounut-paring oil.

13. A composition according to Claim 1 substantially as described with reference to the accompanying Examples.

14. Process for the preparation of an edible fat composition as claimed in any of the preceding claims comprising fractionating a non-lauric edible C_{16}—C_{18} fat to obtain a stearine fraction and randomising a blend of a lauric fat with a smaller weight of the stearine fraction, if necessary with hydrogenation before or after blending, to obtain a composition having a maximum slip melting point of 45°C, a minimum dilatation at 20°C of 900 and a maximum Iodine Value of 20.

15. Process according to Claim 14 comprising fractionating a palm fat to obtain a stearine having an Iodine Value from 5 to 40, blending the lauric fat with a smaller weight of the stearine, randomising the blend and hydrogenating the randomised blend non-selectively.

16. Process according to Claim 14 comprising hydrogenating a C_{16}—C_{18} edible vegetable fat which is wholly liquid at 15°C to provide a decrease of 20 Iodine Value units, fractionating the hardened fat obtained to produce a stearine fraction having an Iodine Value from 5 to 40 and a slip melting point from 40 to 60°C, blending coconut oil with a smaller weight of the stearine, randomly interesterifying the blend and hydrogenating the randomised blend non-selectively.

17. A process for the preparation of an edible fat composition according to Claim 1 substantially as described with reference to the accompanying Examples.

18. Edible fats whenever prepared by a process as claimed in any of Claims 14 to 17.

19. Confectionery products containing a fat constituent as claimed in any of the preceding Claims 1 to 13 and 18.

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